

Notice of Allowability

Application No.

10/664,440

Examiner

Johnnie L. Smith II

Applicant(s)

ASAKI ET AL.

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to RCE filed 04/15/05.
2. ☒ The allowed claim(s) is/are 1-8 and 11-13.
3. ☒ The drawings filed on 18 September 2003 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 0427.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mehran Arjomand on 04/27/2005.

The application has been amended as follows:

Claim 1. A pattern width measuring apparatus for measuring pattern width of a pattern formed on a wafer using an electron beam, comprising:

- an electron beam generating section for generating the electron beam;
- a deflector for scanning the pattern with the electron beam by deflecting the electron beam;
- an electrostatic lens for focusing the electron beam deflected by the deflector onto the wafer or the pattern;

a first secondary electron detector and a second secondary electron detector provided above said electrostatic lens for detecting secondary electrons generated when the electron beam is irradiated on the wafer or the pattern[;] through said electrostatic lens;

a first edge detector for detecting position of a first edge of the pattern based on the quantity of the secondary electrons detected by said first secondary electron detector out of said first secondary electron detector and said second secondary electron detector;

a second edge detector for detecting position of a second edge of the pattern based on the quantity of the secondary electrons detected by said second secondary electron detector out of said first secondary electron detector and said second secondary electron detector; and

a pattern width computing section for computing pattern width of the pattern based on the position of the first edge and the position of the second edge detected by said first edge detector and said second edge detector.

Claim 9. (Canceled)

Claim 11. The pattern width measuring apparatus as claimed in claim [9] 1,

wherein said first secondary electron detector and said second secondary electron detector are oppositely disposed across an optical axis of the electron beam.

Claim 12. A pattern width measuring method for measuring pattern width of a pattern formed on a wafer using an electron beam, comprising steps of:

generating the electron beam;

scanning the pattern with the electron beam by deflecting the electron beam;

focusing the electron beam with an electrostatic lens;

detecting secondary electrons by the first secondary electron detector and the second secondary electron detector provided above said electrostatic lens, the secondary electrons being generated when the electron beam is irradiated on the wafer or the pattern[;] through said electrostatic lens;

detecting position of a first edge of the pattern based on the quantity of the secondary electrons detected by the first secondary electron detector out of the first secondary electron detector and the second secondary electron detector;

detecting position of a second edge of the pattern based on the quantity of the secondary electrons detected by the second secondary electron detector out of the first secondary electron detector and the second secondary electron detector;
and

computing pattern width of the pattern based on the position of the first edge and the position of the second edge detected by said first edge detecting step and said second edge detecting step.

Claim 13. An electron beam exposure apparatus for measuring pattern width of a pattern formed on a wafer using an electron beam, comprising:

- an electron beam generating section for generating the electron beam;
- a deflector for scanning the pattern with the electron beam by deflecting the electron beam;
- an electrostatic lens for focusing the electron beam deflected by the deflector onto the wafer or the pattern;
- a first secondary electron detector and a second secondary electron detector provided above said electrostatic lens for detecting secondary electrons generated when the electron beam is irradiated on the wafer or the pattern[;] through said electrostatic lens;
- a first edge detector for detecting position of a first edge of the pattern based on the quantity of the secondary electrons detected by said first secondary electron detector out of said first secondary electron detector and said second secondary electron detector;

a second edge detector for detecting position of a second edge of the pattern based on the quantity of the secondary electrons detected by said second secondary electron detector out of said first secondary electron detector and said second secondary electron detector, the [first] second edge detector determining a position of a [first] second local minimum of the quantity of the detected secondary electrons; and

a pattern width computing section for computing pattern width of the pattern based on the position of the first edge and the position of the second edge detected by said first edge detector and said second edge detector.

Allowable Subject Matter

2. Claims 1-8 and 11-13 are allowed.
3. The following is an examiner's statement of reasons for allowance: the prior art searched and cited failed to teach or fairly suggest applicant's disclosure of having a pattern width measuring apparatus for measuring pattern width of a pattern formed on a wafer using an electron beam, comprising an electrostatic lens for focusing the electron beam deflected by the deflector onto the wafer or the pattern and a first secondary electron detector and a second secondary electron detector provided above said electrostatic lens for detecting secondary electrons

generated when the electron beam is irradiated on the wafer or the pattern through said electrostatic lens in combination with the remaining elements of claims 1, 12 and 13. Claims 2-8, and 11 are allowable because of their dependencies. The prior art teaches similar apparatuses, but none having the disclosed electrostatic lens, first edge detector for detecting a position of a first edge of the pattern based on the quantity of the secondary electrons detected by said first secondary electron detector, and second edge detector for detecting a position of a second edge of the pattern based on the quantity of the secondary electrons detected by said second secondary electron detector located relative to the said lens.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US patent 5,497,034 (Yamaguchi et al) contains art similar to that being claimed by applicant, more specifically, the use of electrostatic lens and other related components.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johnnie L. Smith II whose telephone number is 571-272-2481. The examiner can normally be reached on Monday-Thursday 7-4 P.M. and Alternate Fridays.

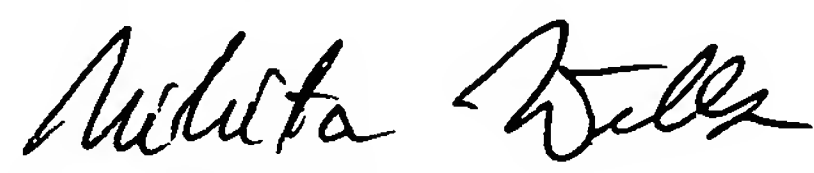
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on 571-272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



JLSII

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Examiner
Art Unit 2881



NIKITA WELLS
PRIMARY EXAMINER

06/13/05